

# Charting the Endometrial Cancer Care Pathway

## A Baseline Audit

Jason Attard, Mark R Brincat, Charmaine Tanti, Nicole Buhagiar, Marie Claire Farrugia, Jean-Claude Farrugia, Stefan Laspina, Yves Muscat Baron, Danika Marmarà

### INTRODUCTION

Longer waiting times from diagnosis to surgical resection have been found to negatively impact the overall survival and quality of life of women with endometrial cancer. The Cancer Care Pathway Directorate adopted the UK National Waiting Times Monitoring Dataset Guidance, to improve the timeliness of services along the cancer care pathway. From this, three key targets were identified: 1) Maximum 14-day wait from urgent GP referral for suspected cancer to first outpatient attendance (operational standard of 93%), 2) Maximum 31-day wait from decision to treat to first definitive treatment (operational standard of 96%), and 3) Maximum 62-day wait from urgent GP referral for suspected cancer to first treatment (operational standard of 85%). The aim of this baseline audit was to chart the time-frames of the various stages in the endometrial cancer pathway of patients diagnosed with this disease between 2015 and 2016 to assess for and identify delays in referral, investigation and care.

### METHODS

A tool was developed following consultation with key stakeholders. Data protection clearance was obtained. Patient medical and oncology files, hospital databases, and MDT documentation for confirmed endometrial cancer cases were reviewed between September 2017 – March 2018.

### RESULTS

A total of 101 endometrial cancer cases were included in the audit. The proportion of cases which met the 14-day, 31-day and 62-day wait KPIs operational standards were 39.1%, 81.2% and 17.2% respectively.

### CONCLUSION

The endometrial cancer care pathway timeframes did not meet the KPIs operational standards. Fast-track coordinators and nurse navigators could improve continuity and coordination of patient care.

**Jason Attard\*** MD, MSc

Higher Specialist Trainee in Public Health Medicine  
[jason.attard@gov.mt](mailto:jason.attard@gov.mt)

**Mark R Brincat** MD, MSc

Higher Specialist Trainee in Obstetrics and Gynaecology

**Charmaine Tanti** MD

Basic Specialist Trainee in Obstetrics and Gynaecology

**Nicole Buhagiar** MD

Foundation Doctor

**Marie Claire Farrugia** MD

Foundation Doctor

**Jean-Claude Farrugia** MD

Foundation Doctor

**Stefan Laspina** MD, PhD FFPATH, FRCPath

Clinical Chairperson, Health-Sir Anthony Mamo Oncology Centre

**Yves Muscat Baron** MD, FRCOG, FRCPI, PhD.

Chairman of Department of Obstetrics and Gynaecology

**Danika Marmarà** BSc (Hons.), MSc (Lond.)

Director (Cancer Care Pathways)

\*Corresponding author

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## INTRODUCTION

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Endometrial cancers constitute 7.3% of cancer cases in women in Malta with a five-year average of 72 new cases per year between 2011 and 2015. Uterine cancer is the main cause for 4.3% of cancer death in Maltese women with a five-year average of 17 deaths annually between 2011 and 2015.<sup>1</sup> The 1-year and 5-year survival for uterine cancers diagnosed in 2000–2007 in Malta were 90.4% [95% confidence interval (CI) 86.9 – 94.1%] and 80.2% (95% CI 73.9 – 86.9%) respectively.<sup>2</sup> In a recent, population-based study, longer waiting times from diagnosis to surgical resection have been found to negatively impact the overall survival of women with endometrial cancer.<sup>3</sup> Furthermore, longer waiting times have been found to have a nocebo effect,<sup>4</sup> and poorer quality of life and patient satisfaction.<sup>5</sup>

The Cancer Care Pathway Directorate, which was established in 2014, adopted the UK National Waiting Times Monitoring Dataset Guidance, to improve the timeliness of services along the cancer care pathway.<sup>6</sup> From this, three key targets were identified:

- Maximum two weeks from urgent GP referral for suspected cancer to first outpatient attendance [Operational Standard of 93%].
- Maximum one month (31 days) from decision to treat to first definitive treatment [Operational Standard of 96%].
- Maximum two months (62 days) from urgent GP referral for suspected cancer to first treatment [Operational Standard of 85%].

The New Zealand Cancer Plan: Better, Faster Cancer Care 2015-2018 and the Australian Hospital Performance: Cancer surgery waiting

times in public hospitals in 2012-13 have identical key targets.<sup>7-8</sup>

Timeliness in histopathology reporting ensures an appropriate level of patient care. The Royal College of Pathologists have produced a set of KPIs, two of which are related to histopathology reporting timeframes.<sup>9</sup>

1. Histopathology diagnostic biopsy turnaround times: Percentage of diagnostic biopsies reported, confirmed and authorised within 7 days of biopsy (RCPATH Challenge: 80% by April 2012 increased to 90% by April 2014).
2. Overall Histopathology reporting turnaround times: Percentage of all histopathology and diagnostic cytology final reports available within 10 calendar days of procedure (RCPATH Challenge: 80% by April 2012 increased to 90% by April 2014).

According to the UK National Waiting Times Monitoring Dataset Guidance, all subsequent treatments for primary and recurrent cancer need to have a 31-day period recorded.<sup>6</sup> The operational standards for subsequent surgery, drug treatment, and radiotherapy are 94%, 98% and 94%, respectively.

The aim of this baseline audit was to chart the time-frames of the various stages in the endometrial cancer pathway of patients diagnosed with this disease between 2015 and 2016 to assess for and identify delays in referral, investigation and care.

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## METHODOLOGY

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A retrospective audit was conducted to chart the endometrial cancer pathway. The study sample was obtained from the histopathology

department information officer using the Laboratory Information System (LIS) of Mater Dei Hospital (MDH) and comprised patients who were diagnosed with cancer in 2015 and 2016.

The data collection tool was developed following consultation with key stakeholders in the field including consultant gynaecologists, as well as doctors and the Cancer Care Pathways Directorate.

Data protection clearance was obtained prior to the start of data collection which took place between September 2017 and February 2018. Data was retrieved from patients' personal medical and oncology files at MDH and Sir Anthony Mamo Oncology Centre, iSoft Clinical Manager, chemotherapy and radiotherapy databases, and email records for multidisciplinary team (MDT) meeting.

Descriptive and inferential analyses were performed through a combination of Microsoft Office Professional Plus 2010 Excel, and IBM SPSS Statistics version 22. In view of the heavy right skewed distributions for the various timeframes, medians and quartiles were preferentially used for the descriptive statistics. Tests performed were Fisher's Exact test and binary logistic regression.

## RESULTS

### Sample overview

The original dataset provided by the histopathology department information officer consisted of a total of 491 patients. 285 duplicate entries were removed. A total of 101 patient medical records were available and included in the final analysis presented in the report. The mean age at diagnosis of this group of patients was 61 years (standard deviation = 8.8 years, median = 60 years, range

= 42-86 years). Diagnostic methods and cancer characteristics are summarised in Table 1.

The initial point of contact with the health care system including the date was identified in 94 out of 101 cases (93.1%) of endometrial cancer and are summarised in Table 2.

**Table 1** Diagnostic methods and cancer characteristics

Variables	n	%
<b>Biopsy method</b>		
Intrauterine endometrial sampler	19	18.8%
D&C	76	75.2%
Unknown	6	5.9%
<b>Preoperative imaging</b>		
CT	54	53.5%
MRI	2	2.0%
Both	1	1.0%
None	44	43.6%
<b>Histological diagnosis</b>		
Endometrioid	92	91.1%
Other	9	8.9%
<b>FIGO grading</b>		
G1	66	65.3%
G2	19	18.8%
G3	16	15.8%
<b>FIGO staging</b>		
FIGO IA	67	66.4%
FIGO IB	18	17.8%
FIGO II	8	7.9%
FIGO IIIA	1	1.0%
FIGO IIIB	4	4.0%
FIGO IIIC1	1	1.0%
Unknown	2	2.0%

**Table 2** Initial point of contact with the health care system

Initial Contact with the Health System (Day Zero)	<i>n</i>	%
GP referral to GOP	41	40.6%
GP referral to private gynaecologist	1	1.0%
GP referral to A&E	6	5.9%
Self-referral to A&E	9	8.9%
Private gynaecologist referral to GOP	37	36.6%
Unknown	7	6.9%

#### KEY PERFORMANCE INDICATORS (KPI)

The distribution of the number of days waiting for the KPI timeframes and the GOP new case appointment to post-biopsy GOP follow up (decision to treat) appointment timeframe were summarised in Table 3.

'14-day wait' from referral to specialist review at outpatients: 34 out of 87 patients with endometrial cancer (39.1%) were seen by a specialist at GOP within two weeks of referral. 52 out of 87 patients with endometrial cancer (59.8%) were seen by a specialist either at GOP or in the initial contact in private practice within two weeks.

'31-day wait' from decision to treat to receipt of first treatment: 69 out of 85 patients (81.2%) with endometrial cancer received first treatment following decision to treat within a 31-day timeframe.

'62-day wait' from referral to receipt of first treatment: Only 16 out of 93 patients (17.2%) with endometrial cancer received first

treatment following referral within 62 days. 45 out of 93 patients with endometrial cancer (48.4%) received first treatment after being seen by a specialist either at GOP or in the initial contact in private practice within 62 days.

The '14-day wait' and '62-day wait' key performance indicator for the endometrial cancer care pathway could be analysed in those cases where date "day zero" and the date of the GOP new case appointment or first treatment were both known.

#### INTRADEPARTMENTAL TIMEFRAMES

The distribution of the number of days from procedure to histology report were summarised in Table 4.

Histopathology diagnostic biopsy turnaround times: 50 out of 94 histopathology reports (53.2%) were available within 7 calendar days of the diagnostic biopsy.

Histopathology surgical resection reporting turnaround times: 58 out of 99 histopathology reports (58.6%) were available within 10 calendar days of surgical resection.

The distribution of the number of days from the first oncology review to oncology treatment were summarised in Table 5. 9 out of 27 cases (33.3%) and 9 out of 10 cases (90%) received radiotherapy and chemotherapy respectively within 31 days from the first oncological review. Cases requiring radiotherapy had longer waits for treatment when compared to cases requiring chemotherapy from oncological review. However, 9 cases requiring radiotherapy received treatment after chemotherapy. After excluding these cases, 8 out of 18 cases (44.4%) received radiotherapy within 31 days from the first oncological review.

**Table 3** Distribution of the number of days waiting for the three KPIs and GOP new case appointment to decision to treat timeframe

Number of Days from:	<i>n</i>	Mean	SD	Median	1st Quartile	3rd Quartile
Day Zero to GOP new case	87	32.5	27.5	25.0	9.0	54.0
Decision to treat to first treatment	85	23.2	25.5	15.0	10.0	27.5
Day Zero to first treatment	93	122.7	95.2	110.0	66.5	146.0
GOP new case to decision to treat	80	74.4	93.3	49.0	35.0	71.8

**Table 4** Distribution of the number of days from procedure to histology report

Number of Days from:	<i>n</i>	Mean	SD	Median	1st Quartile	3rd Quartile
Diagnostic biopsy to histology report	94	9.4	6.1	7.0	6.0	11.3
Surgical resection to histology report	99	12.0	6.8	10.0	7.0	15.0

**Table 5** Distribution of the number of days from first oncology review to oncology treatment

Number of Days from:	<i>n</i>	Mean	SD	Median	1st Quartile	3rd Quartile
First oncology review to radiotherapy	27	75.6	70.0	41.0	28.0	114.5
First oncology review to chemotherapy	10	24.6	19.1	25.0	10.0	31.0

**Table 6** Distribution of the number of days of interdepartmental transitioning

GOP Appointment to Procedure Timeframes						
Number of Days from:	<i>n</i>	Mean	SD	Median	1st Quartile	3rd Quartile
GOP new case to diagnostic biopsy	75	56.1	92.1	26.0	17.0	48.0
Post-biopsy GOP follow up (decision to treat) to surgical resection	85	23.2	25.5	15.0	10.0	27.5
Histology Report to GOP Appointment Timeframes						
Number of Days from:	<i>n</i>	Mean	SD	Median	1st Quartile	3rd Quartile
Biopsy result to GOP follow-up	86	16.4	12.0	14.0	8.8	20.3
Surgical resection histology report to GOP follow-up	94	21.5	14.4	18.0	12.0	25.5
Preoperative Imaging						
Number of Days from:	<i>n</i>	Mean	SD	Median	1st Quartile	3rd Quartile
Post-biopsy GOP follow up (decision to treat) to imaging	46	8.5	15.3	4.0	0.0	9.8
Imaging to surgical resection	52	7.4	6.1	6.0	3.0	11.0
Multidisciplinary Team Meetings						
Number of Days from:	<i>n</i>	Mean	SD	Median	1st Quartile	3rd Quartile
Biopsy result to MDT meeting	20	31.9	26.3	24.0	12.0	42.0
Surgical resection histopathology report to MDT meeting	35	20.3	14.6	16.0	8.0	36.0
Oncology referral						
Number of Days from:	<i>n</i>	Mean	SD	Median	1st Quartile	3rd Quartile
Oncology referral to first oncology review	53	11.2	7.4	10.0	6.5	14.0

## INTERDEPARTMENTAL TIMEFRAMES

The distribution of the number of days of interdepartmental transitioning were summarised in Table 6.

A Fisher's Exact test showed that the initial contact with the health system was associated with statistically significant differences with the 14-day wait KPI ( $p=0.005$ ). Binary logistic regression showed that when compared to private gynaecologist referral, cases which were referred to GOP by GP referral were statistically significantly more likely to breach the 14-day wait KPI (see Table 7). When compared to GP referral, cases which were referred to A&E, went directly to A&E or were referred to GOP by a private gynaecologist were statistically significantly less likely to breach the 14-day wait KPI ( $p<0.05$ ) (see Table 8).

A Fisher's Exact test showed that the initial contact with the health system was associated with statistically significant differences with the 62-day wait KPI ( $p=0.026$ ). Binary logistic regression showed that when compared to private gynaecologist referral to GOP, cases which went to directly to A&E were statistically significantly less likely to breach the 62-day wait KPI (see Table 9). The single case referred by GP to a private gynaecologist was excluded from the analysis. When compared to GP referral to GOP, both GP referral to A&E and self-referral to A&E were less likely to breach the 62-day wait KPI ( $p<0.05$ ) (see Table 10).

A Fisher's Exact test showed that there were no statistically significant differences between initial contact with the health system and the 31-day wait KPI ( $p=0.668$ ). The single case referred by GP to a private gynaecologist was excluded from the analysis.

**Table 7** Binary logistic regression between initial contact with the health system and 14-day wait KPI with private gynaecologist referral to GOP as the reference category

Initial Contact with the Health System	<i>n</i>	Odds Ratio	95% CI		<i>p</i> value
			Lower	Upper	
GP Referral to GOP	41	3.358	1.244	9.065	0.017
GP Referral to A&E	5	0.236	0.024	2.330	0.217
Self-Referral to A&E	6	0.472	0.076	2.921	0.420
Private gynaecologist referral to GOP*	35	-	-	-	0.015

\*Reference category



**Table 8** Binary logistic regression between initial contact with the health system and 14-day wait KPI with GP referral to GOP as the reference category

Initial Contact with the Health System	<i>n</i>	Odds Ratio	95% CI		<i>p</i> value
			Lower	Upper	
GP Referral to GOP*	41	-	-	-	0.015
GP Referral to A&E	5	0.070	0.007	0.710	0.024
Self-Referral to A&E	6	0.141	0.022	0.896	0.038
Private gynaecologist referral to GOP	35	0.298	0.110	0.804	0.017

\*Reference category

**Table 9** Binary logistic regression between initial contact with the health system and 62-day wait KPI with private gynaecologist referral to GOP as the reference category

Initial Contact with the Health System	<i>n</i>	Odds Ratio	95% CI		<i>p</i> value
			Lower	Upper	
GP Referral to GOP	41	4.707	0.91	24.345	0.065
GP Referral to A&E	6	0.483	0.073	3.187	0.450
Self-Referral to A&E	9	0.193	0.041	0.912	0.038
Private gynaecologist referral to GOP*	36	-	-	-	0.001

\*Reference category

**Table 10** Binary logistic regression between initial contact with the health system and 62-day wait KPI with private gynaecologist referral to GOP as the reference category

Initial Contact with the Health System	<i>n</i>	Odds Ratio	95% CI		<i>p</i> value
			Lower	Upper	
GP Referral to GOP*	41	-	-	-	0.026
GP Referral to A&E	6	0.103	0.011	0.988	0.044
Self-Referral to A&E	9	0.041	0.006	0.284	0.001
Private gynaecologist referral to GOP	36	0.212	0.041	1.099	0.065

\*Reference category



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## DISCUSSION

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The results of this audit need to be considered in the light of several limitations. The convenience sampling and number of cases included may affect the generalisability of this audit. We estimate 72 new cases of endometrial cancer per year; the sample size analysed is 101 cases over the two-year period. The medical files of patients diagnosed with endometrial cancer in 2015 and 2016 who had died before the data collection phase of the audit could not be analysed. As this audit was retrospective, it was prone to missing data such as delay to treatment due to medical reasons. Additionally, it is unknown whether patients had their appointments rescheduled following non-attendance. Moreover, it was difficult to link the oncology consultation which lead to the first oncological treatment. Therefore, the first oncological new case appointment was used. This may have overestimated the oncology review to oncology treatment timeframes. Finally, the quality of the information provided in the ticket of referral written by a GP was not assessed in the current audit, and it should be acknowledged that this information may influence the urgency with which a case is reviewed at GOP.

The 14-day wait KPI, allowing a maximum two weeks from referral for suspected cancer to first outpatient attendance, was well below the accepted operational standard of 93% as described in the UK National Waiting Times Monitoring Dataset Guidance. When compared with GP referral to GOP, GP referral to A&E, self-referral to A&E, and private gynaecologist referral to GOP are less likely to exceed the 14-day wait KPI. Measures that could decrease the number of days from time of referral to GOP new case appointment include further education for primary care

doctors and immediate vetting of referral letters.<sup>10</sup>

The 31-day wait KPI, allowing a maximum one month from decision to treat to first definitive treatment, was below the accepted operational standard of 96%. Preoperative imaging and post-biopsy MDT meetings were not found to delay definitive surgical treatment. Medical problems and other conditions which pose a problem for anaesthesia are possible causes for exceeding the 31-day wait KPI. Interdepartmental fast-track channels between gynaecology, anaesthesia and medical specialities would help improve this KPI.

The 62-day wait KPI, allowing a maximum two months from referral for suspected cancer to first treatment, was well below the accepted operational standard of 85%. When compared with GP referral to GOP, self-referral to A&E and GP referral to A&E are less likely to exceed the 62-day wait KPI. Private gynaecologist referral to GOP appeared less likely to breach the 62-day wait, however it did not reach statistical significance. Of note, the 62-day wait KPI was markedly worse when compared with the 14-day wait KPI with a difference of 21.9%. This finding prompted an analysis of the overall and interim inter- and intra-departmental timeframes between the GOP new case appointment and post-biopsy GOP follow up (decision to treat) appointment. Based on the three KPIs, the overall GOP new case to decision to treat timeframe should be 17 calendar days, assuming a maximum of 14 days from referral to GOP. However, based on the medians described in the results, there are potential delays in having a diagnostic biopsy, histology reporting and having a follow up appointment at GOP. Measures to decrease the time to diagnostic biopsy include training GPs to do intrauterine endometrial sampler

biopsies and setting up a one-stop shop for women referred with post-menopausal bleeding for hysteroscopy and curettage <sup>11</sup>. The post-menopausal bleeding (PMB) clinic at Mater Dei Hospital started in 2018. GP referral to the PMB clinic will most likely improve both 14-day and 62-day wait KPIs. The histopathology department can flag biopsies which are suspicious for cancer to be able to prioritise accordingly. Furthermore, once the histology report is ready, a follow up GOP appointment should be scheduled for the next outpatient session.

Up to three-fourths of cases referred to oncology had an oncological review within two weeks. Waiting times for radiotherapy treatment following oncological review were below the operational standard. Waiting times for chemotherapy treatment following oncology review were just below the operational standard. Measures to improve the waiting times for radiotherapy treatment, through restructuring of the radiotherapy department have been implemented in the interim between the audit years 2015 and 2016 and April 2018.

More research needs to be done to address the important limitations previously described. These include prospective and qualitative studies. Furthermore, there is a dire need for a robust business process across and within primary and secondary healthcare supported by an information technology infrastructure to readily track patients as they navigate the health care system. Such processes and infrastructure would make it easier to retrieve data to re-audit and close the audit cycle.

A fast-track coordinator and a nurse navigator would further ensure better continuity and

coordination of patient care by tracking the patient from referral to diagnosis and from diagnosis onward respectively.

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## CONCLUSION

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The endometrial cancer care pathway timeframes did not meet the 14-day, 31-day and 62-day wait KPIs operational standards. Seeking a private gynaecological consultation or referral to the emergency department have been shown to be the most efficient pathways for patients to get timely investigation and treatment when compared with GP referral to gynaecological outpatients. The introduction of the post-menopausal bleeding clinic is a step in the right direction to improve on these outcomes and decrease the load from emergency services.

Further recommendations include:

- Fast-track referral by GPs to secondary health care services for women with symptoms suspicious for endometrial cancer.
- Setting evidence-based targets and timelines which best suit our health care system.
- Communicate these targets and timelines to key stakeholders (namely primary health care and the departments of obstetrics and gynaecology, histopathology, radiology, outpatients and oncology).
- Engaging key workers to track patients along the care pathway.
- Re-audit following changes in the health service.

## REFERENCES

1. Malta National Cancer Registry - Uterus Cancers [Internet]. 2018 [cited 2019 Mar 21]. Available from: [https://deputyprimeminister.gov.mt/en/dhir/Documents/Cancer/Cancer Docs June 2018/Uterus\\_2016.pdf](https://deputyprimeminister.gov.mt/en/dhir/Documents/Cancer/Cancer Docs June 2018/Uterus_2016.pdf)
2. Sant M, Chirlaque Lopez MD, Agresti R, Sánchez Pérez MJ, Holleczeck B, Bielska-Lasota M, et al. Survival of women with cancers of breast and genital organs in Europe 1999-2007: Results of the EUROCARE-5 study. *Eur J Cancer*. 2015;51(15):2191–205.
3. Elit LM, O’Leary EM, Pond GR, Seow HY. Impact of wait times on survival for women with uterine cancer. *J Clin Oncol*. 2014;32(1):27–33.
4. Dietsch E, Davies C. The nocebo effect for women in waiting. *Collegian* [Internet]. 2007 Jul [cited 2018 Apr 6];14(3):9–14. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/18074766>
5. Robinson KM, Christensen KB, Ottesen B, Krasnik A. Diagnostic delay, quality of life and patient satisfaction among women diagnosed with endometrial or ovarian cancer: a nationwide Danish study. *Qual Life Res* [Internet]. 2012 Nov 4 [cited 2018 Apr 6];21(9):1519–25. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22138966>
6. Pearson J, Doherty K, Duffy S. Cancer Waiting Times: A Guide (Version 9.0) [Internet]. Leeds: Cancer Waiting Times Team; 2015. p. 1–96. Available from: [https://digital.nhs.uk/media/896/National-Cancer-Waiting-Times-Monitoring-Dataset-Guidance/pdf/National\\_Cancer\\_Waiting\\_Times\\_Monitoring\\_Dataset\\_Guidance](https://digital.nhs.uk/media/896/National-Cancer-Waiting-Times-Monitoring-Dataset-Guidance/pdf/National_Cancer_Waiting_Times_Monitoring_Dataset_Guidance)
7. Ministry of Health. New Zealand Cancer Plan Better, Faster Cancer Care 2015–2018 [Internet]. Ministry of Health. Wellington; 2014. Available from: <http://www.health.govt.nz/system/files/documents/publications/new-zealand-cancer-plan-2015-2018-dec14.pdf>
8. National Health Performance Authority. Hospital Performance: Cancer surgery waiting times in public hospitals in 2012-13. Sydney; 2011.
9. Key Performance Indicators in Pathology: Recommendations from the Royal College of Pathologists [Internet]. Royal College of Pathologists; 2013. p. 1–23. Available from: <http://www.rcpath.org/resourceLibrary/key-performance-indicators-in-pathology---recommendations-from-the-royal-college-of-pathologists-.html>
10. Askew C, Gangji A. Gynaecological cancer pathway for faster cancer treatment: a clinical audit. *J New Zeal Med Assoc*. 2016;129(1444):17–27.
11. Yoon Kang M, Sykes P, Herbison P, Petrich S. Retrospective analysis on timeframes of referral, diagnosis and treatment of patients with endometrial carcinomas in Dunedin Hospital, 2008-2011. *J New Zeal Med Assoc*. 2013;126(1384):84–94.